

### **Amendments to the Claims**

This listing of claims will replace all prior versions and listings of claims in the application:

1. (Currently Amended) A modified ~~An~~- $\alpha$ -glucan phosphorylase having improved thermostability, which is obtained by modifying a natural  $\alpha$ -glucan phosphorylase, wherein the natural  $\alpha$ -glucan phosphorylase is obtained from a plant; ~~and~~ wherein the  $\alpha$ -glucan phosphorylase having improved thermostability has an amino acid substitution at residue which is different from that of the natural  $\alpha$ -glucan phosphorylase and has an amino acid residue of C, I, L, V or W in a position corresponding to position 7 in a motif sequence 3L: R-I-V-K-F-I-T-D-V (SEQ ID NO: 47);

wherein said substitution is a substitution to C, I, L, V, or W;

~~wherein the  $\alpha$ -glucan phosphorylase having improved thermostability has the same amino acid sequence as that of the natural  $\alpha$ -glucan phosphorylase except for the substitution defined above, or has an amino acid sequence in which, in addition to substitution defined above, one or several amino acids are deleted, substituted or added relative to an amino acid sequence of natural  $\alpha$ -glucan phosphorylase;~~

wherein the natural  $\alpha$ -glucan phosphorylase has an amino acid sequence which is at least 50% identical to the sequence of SEQ ID NO: 2 (residues 1-916);

wherein the  $\alpha$ -glucan phosphorylase having improved thermostability has an amino acid sequence which is at least 95% identical to the sequence of the natural  $\alpha$ -glucan phosphorylase;

wherein the enzyme activity of the  $\alpha$ -glucan phosphorylase having improved thermostability is equivalent or superior to the natural  $\alpha$ -glucan phosphorylase; and

wherein enzyme activity of the  $\alpha$ -glucan phosphorylase having improved thermostability at 37°C, after heating in a 20 mM citrate buffer (pH 6.7) at 60°C for 10 minutes, is 20% or more of enzyme activity of the  $\alpha$ -glucan phosphorylase having improved thermostability at 37°C, before heating.

2. (Canceled)
3. (Canceled)
4. (Currently Amended) The  $\alpha$ -glucan phosphorylase having improved thermostability according to claim 1, wherein the amino acid sequence of the natural  $\alpha$ -glucan phosphorylase is encoded by a nucleic acid molecule which hybridizes under stringent condition to a nucleic acid molecule consisting of a base sequence encoding the ~~an~~-amino acid sequence from position 1 to position 916 of SEQ ID NO: 2,  
wherein the stringent condition is a hybridization at 65°C in a solution containing 50% formamide, 5 ×SSC (750 mM NaCl, 75 mM trisodium citrate), 50 mM sodium phosphate (pH 7.6), 5×Denhart's solution (0.2% BSA, 0.2% Ficoll 400 and 0.2% polyvinylpyrrolidone), 10% dextran sulfate, and 20 µg/ml denatured sheared salmon sperm DNA, and washing under the condition of 65°C using a SSC (saline-sodium citrate) solution having a 0.1 to 2-fold concentration, and  
wherein the composition of the SSC solution having a 1-fold concentration is 150 mM sodium chloride and 15 mM sodium citrate.
5. (Previously Presented) The  $\alpha$ -glucan phosphorylase having improved thermostability according to claim 1, wherein the natural  $\alpha$ -glucan phosphorylase is a type L  $\alpha$ -glucan phosphorylase, and the  $\alpha$ -glucan phosphorylase having improved thermostability has an amino acid residue which is different from that of the natural  $\alpha$ -glucan phosphorylase in a position corresponding to position 7 in the motif sequence 3L.
6. (Canceled)
7. (Previously Presented) The  $\alpha$ -glucan phosphorylase having improved thermostability according to claim 1, wherein an amino acid sequence of the natural  $\alpha$ -glucan phosphorylase is position 1 to position 916 of SEQ ID NO: 2.

8. (Previously Presented) The  $\alpha$ -glucan phosphorylase having improved thermostability according to claim 1, wherein the natural  $\alpha$ -glucan phosphorylase is obtained from potato or *Arabidopsis thaliana*.

Claims 9-15. (Canceled)

16. (Previously Presented) The  $\alpha$ -glucan phosphorylase having improved thermostability according to claim 1, wherein an amino acid residue at a position corresponding to position 7 in the motif sequence 3L is selected from the group consisting of C, I, L and V.

17. (Original) The  $\alpha$ -glucan phosphorylase having improved thermostability according to claim 1, wherein enzyme activity at 37°C of the  $\alpha$ -glucan phosphorylase having improved thermostability after heated in a 20 mM citrate buffer (pH 6.7) at 60°C for 10 minutes is 30% or more of enzyme activity at 37°C of the  $\alpha$ -glucan phosphorylase having improved thermostability, before the heating.

18. (Original) The  $\alpha$ -glucan phosphorylase having improved thermostability according to claim 1, wherein enzyme activity of the  $\alpha$ -glucan phosphorylase having improved thermostability at 37°C, after heating in a 20 mM citrate buffer (pH 6.7) at 65°C for 2 minutes, is 10% or more of enzyme activity of the  $\alpha$ -glucan phosphorylase having improved thermostability at 37°C, before heating.

19. (Original) The  $\alpha$ -glucan phosphorylase having improved thermostability according to claim 1, wherein storage stability thereof is improved as compared with the natural  $\alpha$ -glucan phosphorylase.

Claims 20-33 (Canceled)

34. (Currently Amended) A modified An  $\alpha$ -glucan phosphorylase having improved thermostability, which is obtained by modifying a natural  $\alpha$ -glucan phosphorylase obtained from a plant,

wherein the  $\alpha$ -glucan phosphorylase having improved thermostability has an amino acid substitution at residue which is different from an amino acid residue of the natural  $\alpha$ -glucan phosphorylase and has an amino acid residue C, I, L, V or W in a position corresponding to position 7 in a motif sequence 3L: R-I-V-K-F-I-T-D-V (SEQ ID NO: 47);

wherein said substitution is a substitution to C, I, L, V or W;

~~wherein the  $\alpha$ -glucan phosphorylase having improved thermostability has the same amino acid sequence as that of the natural  $\alpha$ -glucan phosphorylase except for the substitution defined above, or has an amino acid sequence in which, in addition to substitution defined above, one or several amino acids are deleted, substituted or added relative to an amino acid sequence of natural  $\alpha$ -glucan phosphorylase,~~

wherein the natural  $\alpha$ -glucan phosphorylase has an amino acid sequence which is at least 50% identical to the sequence of SEQ ID NO: 2 (residues 1-916);

wherein the  $\alpha$ -glucan phosphorylase having improved thermostability has an amino acid sequence which is at least 95% identical to the sequence of the natural  $\alpha$ -glucan phosphorylase;

wherein the enzyme activity of the  $\alpha$ -glucan phosphorylase having improved thermostability is equivalent or superior to the natural  $\alpha$ -glucan phosphorylase,

wherein the enzyme activity of the  $\alpha$ -glucan phosphorylase having improved thermostability at 37°C, after heating in a 20 mM citrate buffer (pH 6.7) at 60°C for 10 minutes, is 20% or more of enzyme activity of the  $\alpha$ -glucan phosphorylase having improved thermostability at 37°C, before heating, and

wherein the  $\alpha$ -glucan phosphorylase having improved thermostability has ability to synthesize an amylose having a weight average molecular weight of 600 kDa or more.

Claims 35-40 (Canceled)